910 Refinement in Defibrillation of Ventricular Fibrillation

Wednesday, April 1, 1998, 4:00 p.m.–5:00 p.m.
Georgia World Congress Center, Room 255W

4:00

910-1 VEST-CPR® System: Results of a Multicenter Randomized Pilot Study

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Background: VEST-CPR is a new system for cardiopulmonary resuscitation (CPR) that offers automated circumferential chest compressions and has been shown in previous studies to improve coronary and cerebral perfusion during cardiac arrest. The purpose of this study was to assess the feasibility of VEST-CPR in different hospital settings and to collect data on safety and efficacy.

Methods: Multicenter randomized study. After approval by local ethics committees, medical and nursing staff of selected hospital areas were trained in the use of VEST-CPR. Subsequently, they were required to respond to cardiac arrest calls and to apply defibrillator pads. Patients with witnessed non-traumatic cardiac arrest were randomized to VEST-CPR or manual CPR if they presented with asystole, pulseless electric activity or ventricular fibrillation after failure of initial defibrillation attempts. Data were analyzed on an intention-to-treat basis.

Results: A total of 81 patients were enrolled over 15 months in five participating hospitals. Of these, 41 were randomized to receive VEST-CPR and 40 to manual CPR. The Vest could be applied with minimal loss of time and the staff met no difficulties with the technique. A trend was observed towards improved survival at discharge with VEST-CPR (7 out of 41 vs. 4 out of 40). VEST-CPR was not associated with an increased risk of complications.

Conclusions: This pilot study confirmed the feasibility of VEST-CPR in ordinary hospital settings. It provided a means of uninterrupted, consistent and effective chest compressions. On the basis of the early survival results, it is likely to be at least as effective as manual standard CPR in terms of outcome. The data now available warrant a definitive survival trial to test the hypothesis that the hemodynamic benefit already demonstrated can be translated into improved resuscitation results for cardiac arrest victims in very high risk subsets.

4:15

910-2 Resuscitation in a Biological Model of Commotio Cordis, Sudden Death From Low Energy Chest Wall Impact

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Background: Commotio cordis is sudden death resulting from a strike to the chest with a low energy object (typically a baseball). The etiology is thought to be ventricular fibrillation (VF). Despite prompt resuscitation, survival is rarely reported in these young athletes.

Methods: In a swine model developed to evaluate the mechanism of commotio cordis, VF could be induced by 30 mph baseball strikes occurring 15 to 30 ms prior to the peak of the T-wave. After VF occurred, precordial thumps were given and animals were defibrillated immediately to 6 minutes later. The initial defibrillation energy for each animal was 100 joules and increased by 50 joules with each attempt.

Results: In our studies VF was induced 25 times. In 19 animals, 2 precordial thumps were performed without success. In 16 animals one defibrillation was required to restore sinus rhythm. In 3 animals, 2 defibrillations were needed, while 6 animals required 3 or more defibrillations. Although VF was terminated in all animals, 5 animals did not survive. In these 5 animals, 4 were defibrillated into complete heart block (without ventricular escape) and 1 animal to pulseless electrical activity. After defibrillation transient heart block was seen in 9 additional animals. Only time to defibrillation predicted survival.

Minutes To Defibrillation

	< 2	2–4	>4	P-value
Ave. no of defibrillations	1.8	1.8	1.4	ns
Heart block	5/13	2/5	5/7	ns
Pulseless Electrical Activity	0/13	0/5	1/7	ns
Successful Resuscitation	13/13	4/5	3/7	0.019

Conclusion: The poor survival in clinical commotio cordis may be due to the frequent occurrence of heart block after defibrillation and the necessity of defibrillation in under 4 minutes.

4:30

910-3 Influence of Cardiopulmonary Resuscitation on Resumption of a Perfusing Rhythm After Defibrillation: Biphasic Versus Damped Sinusoidal Waveforms

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Background: CPR improves survival from VF cardiac arrest. The interactions between CPR and the new biphasic (BiP) defibrillation waveforms have not been defined. Our purpose was to compare the effect of CPR vs no CPR on post-defibrillation rhythms after BiP and damped sinusoidal (DS) shocks.

Methods: We studied 16 pigs; VF was induced electrically and allowed to persist for 6 minutes. During VF each pig received (in random order): a) 6 minutes of full CPR (continuous ventilation and closed chest mechanical compression [Thumper, Michigan Instruments]) followed by DS defibrillation at 100 joules; b) no CPR, DS defibrillation; c) 6 minutes of full CPR and BiP defibrillation at 100 joules; d) no CPR, BiP defibrillation. VF termination resulted in a perfusing rhythm (PR) or pulseless electrical activity (PEA).

Results:

	DS-CPR	DS-noCPR	p	BiP-CPR	BiP-noCPR	p
VF terminated	5/12	7/16	NS	10/14	5/12	NS
PR	1/5	0/7	NS	7/10	0/5	< 0.05
PEA	4/5	7/7	NS	3/10	5/5	< 0.05

Conclusion: In this experimental VF model, CPR facilitated the resumption of a perfusing rhythm after biphasic waveform defibrillation but not after damped sinusoidal waveform defibrillation. The combination of immediate CPR and biphasic waveform defibrillation may yield the best results for resuscitation from VF.

4.45

910-4 Comparison of Monophasic and Truncated Exponential Biphasic Waveforms for External Defibrillation Following Short and Long Durations of Ventricular Fibrillation

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Purpose: Recently, external defibrillators using biphasic truncated exponential (BTE) waveforms (W) have been introduced. Greater efficacy of BTE W over damped sinusoidal monophasic (MS) W, the waveform used in many current defibrillators, has been shown for short durations (D) of ventricular fibrillation (VF). More frequently, though, external defibrillators are used following several minutes of VF. This study measured the efficacy of MS and BTE W after both short and long D of VF.

Methods: Defibrillation thresholds (DFT) were measured in six dogs after 15 s and 5 min of VF using a step-up protocol. CPR was simulated in the last 2 min of VF using femoral-femoral cardiac bypass. Shocks were delivered via two self-adhesive patches on the left and right chest walls. Two W were tested: MS and BTE (8.5/5.7 ms). DFTs were measured for the pair of W in duplicate.

Results: Following 15 seconds of VF, the BTE DFT (9.4 ± 1.7 A, 36 ± 14 J) was sig. lower than the MS DFT (21.9 ± 4.9 A, 58 ± 25 J) ($p < 0.05$) Following 5 min of VF, the BTE DFT (12.4 ± 2.3 A, 52 ± 16 J) was sig. lower (40%) than the MS DFT 29.1 ± 7.8 A, 89 ± 38 J) The ratio of the BTE DFT to the MS DFT was not sig. different after 5 min of VF than it was after 15 s of VF.

Conclusion: These results suggest that certain BTE W are superior to MS W after both short and long D of VF. Studies in the pre-hospital setting are necessary to determine the appropriate energy levels for external defibrillators using biphasic waveforms.

911 Antiplatelet Agents in Coronary Angioplasty

Wednesday, April 1, 1998, 4:00 p.m.–5:00 p.m.
Georgia World Congress Center, Lecture Hall 1

4:00

911-1 Heparin-resistant Thrombin Activity in Coronary Dissection and Threatened Coronary Occlusion During Coronary Interventions

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Background: We have previously reported that patients with heparin-resistant thrombin activity have an increased incidence of ischemic complications while